

Sheet 2

1. Let A and B be events. Find an expression and exhibit Venn-diagram for the event that:
 - a. A but not B occurs i.e. only A occurs.
 - b. Either A or B, but not both occurs; exactly one of the two events occurs.
 - c. A or not B occurs
 - d. Neither A nor B occurs
2. Let A, B, C be events. Find an expression and exhibit Venn-diagram for the event that:
 - a. A and B, but not C occurs
 - b. Only A occurs
3. Let a coin and die be tossed, let the sample space S consists of elements:
 - a. Express explicitly the following event:
A: {head and even numbers appear}
B: {a prime number appear}
C: {tails and odd numbers appear}
 - b. Express explicitly the event that:
 - i. A or B occurs
 - ii. B and C occurs
 - iii. Only B occurs
 - c. Which of the events A, B, C are mutually exclusive.
4. A coin is weighted so that heads are twice as likely to appear as tails. Find $P(T)$ and $P(H)$.
5. Determine the probability of each event:
 - a. An even number appear in the toss of the fair die
 - b. A king appear in drawing a single card from an ordinary pack of 52 cards.
 - c. At least one tail appears in the toss of three fair coin.
 - d. A white marble appear in drawing a single marble from 2 white, 5 red, and 5 blue marbles.
6. 3 light bulbs are chosen at random from 15 of which 5 bulbs are defective. Find the probability that:

- a. Non is defective.
 - b. Exactly on is defective.
 - c. At least one is defective.
7. Class contains 10 boys and 20 girls of which half the boys and half the girls have brown eyes. Find the probability that a person chosen at random is a boy or has brown eyes.
8. Let A and B be events which $P(A)=3/8$, $P(B)=1/2$ and $P(A \cap B)=1/4$ find:
 - a. $P(A \cup B)$
 - b. $P(A^c)$
 - c. $P(A^c \cap B^c)$
 - d. $P(A^c \cup B^c)$
 - e. $P(A \cap B^c)$
 - f. $P(A^c \cap B)$
9. Let A and B events with $P(A \cup B) = 3/4$ and $(A \cap B)=1/4$, $P(A^c)=2/3$ find:
 - a. $P(A)$
 - b. $P(B)$
 - c. $P(A \cap B^c)$
10. Find the probability of an event if the odds that it will occurs are a:b, that is ; a to b.
11. Find the probability P of an event if the odds that it will occurs are 3 to 2.
12. A die is tossed 100 times. The following table lists the six numbers and frequency with which each number appeared.

Number	1	2	3	4	5	6
Frequency	14	17	20	18	15	16

Find the relative frequency F of the event:

- a. A 3 appears.
 - b. A 5 appears.
 - c. A prime no. appears.
 - d. An even no. appears.
13. Prove that $B - A = A^c \cap B$.
14. Let 3 coins be tossed and the number of heads observed. Let A be the event that at least one head appears and let B be the event that all heads or all tails appear. Find $P(A)$ and $P(B)$.

15. Three horses A, B and C are in a race. A is twice as likely to win as B and B is twice as likely to win as C. What are the probabilities of A, B, C.
16. Let a card be selected at random from an ordinary pack of 52 cards let $A = \{\text{the card is spackle}\}$ and $B = \{\text{the card is a face card i.e. Jack or queen or king}\}$ find $P(A)$, $P(B)$ and $P(A \cap B)$.
17. Two men m_1, m_2 and three women w_1, w_2, w_3 are in a chess competition, those of the same gender have equal probability of winning, but each man is twice as likely to win as any woman.
- Find the probability that a woman wins.
 - If m_1 and w_2 are married, find the probability that one of them wins.
18. Let a die be weighted so that the probability of a number appearing when the die is tossed is proportional to the given number let:
 $A = \{\text{even no.}\}$, $B = \{\text{prime no.}\}$, $C = \{\text{odd no.}\}$
- Find the probability of each sample point of the sample space.
 - Find $P(A)$, $P(B)$, and $P(C)$.
 - Find the probability that:
 - An even or prime no. occurs.
 - An odd prime no. occurs.
 - A but not B occurs.
19. Prove that $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$.
20. Let a penny and a half penny and a die be tossed.
- Describe sample space.
 - Express events
 - $A = \{\text{two heads and an even no. appear}\}$
 - $B = \{\text{a 2 appear}\}$
 - $C = \{\text{exactly one head and a prime no. appear}\}$.
 - Express
 - A and B occur.
 - Only B occur.
 - B or C occur.
21. Represent the following using Venn diagrams.
- $W - V$
 - $V^c \cup W$
 - $V \cap W^c$
 - $V^c - W^c$